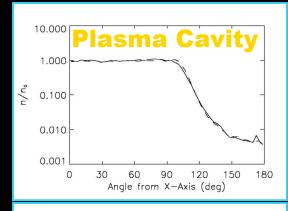
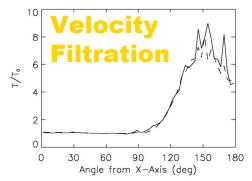
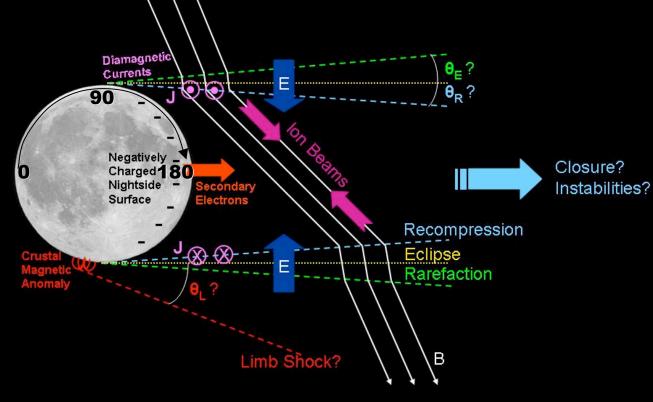


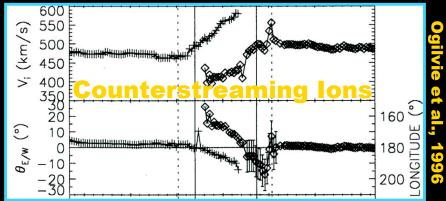
Lunar Plasma Wake



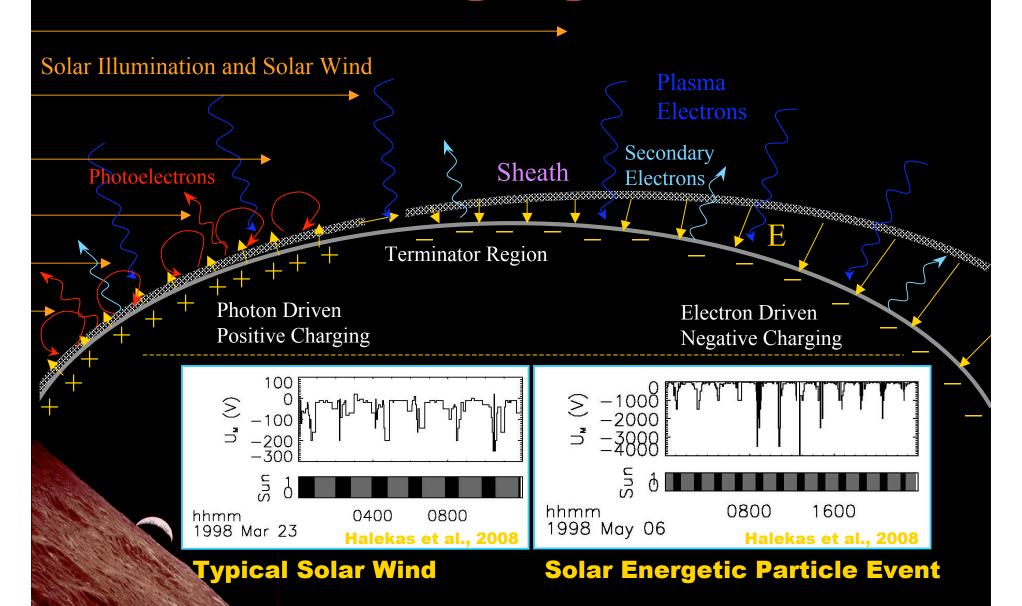


Halekas et al., 2005



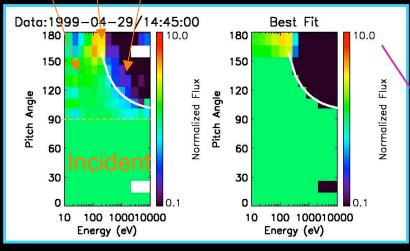


Surface Charging



Measuring Lunar Potentials

Reflected
Secondaries
Lost to Surface

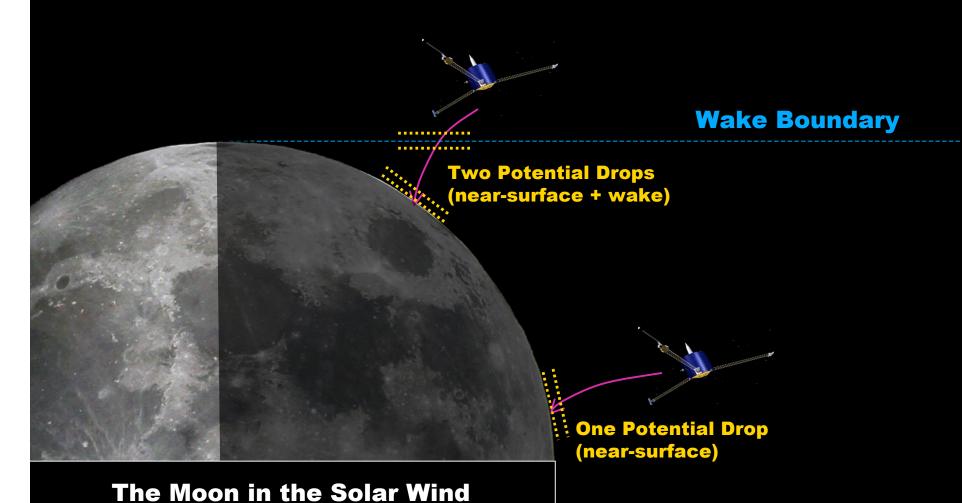


 Fit to measured electron distribution to determine surface magnetic and electric fields

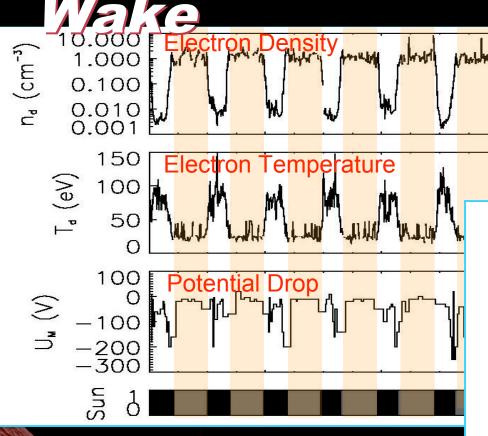
Pitch angle = angle between v and B Plasma Electrons Follow Magnetic Field Lines and Reflect from E & B **Secondary Electrons Accelerated Upward** Downward Electric Field

Negative Surface Charge Layer

Understanding Lunar Potential Measurements

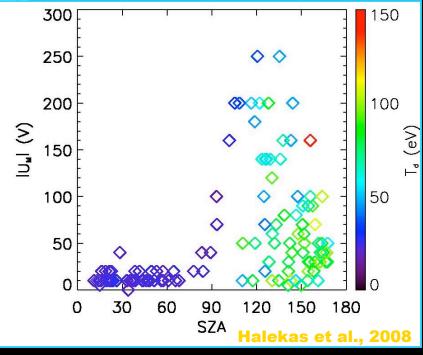


Measured Potential Drops in the Solar Wind and



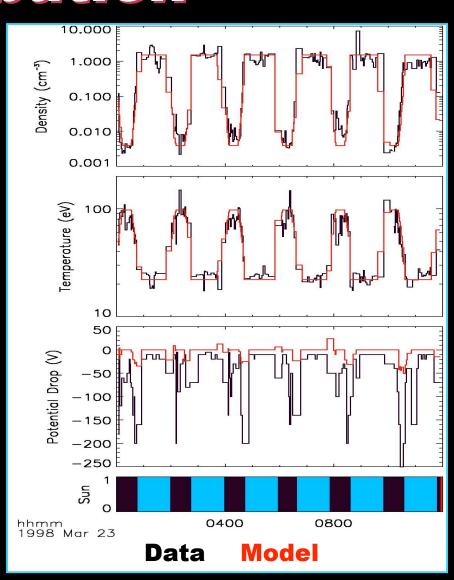
Potential Drop
Time Series

Potential Drop Vs. Solar Zenith Angle



Wake Contribution

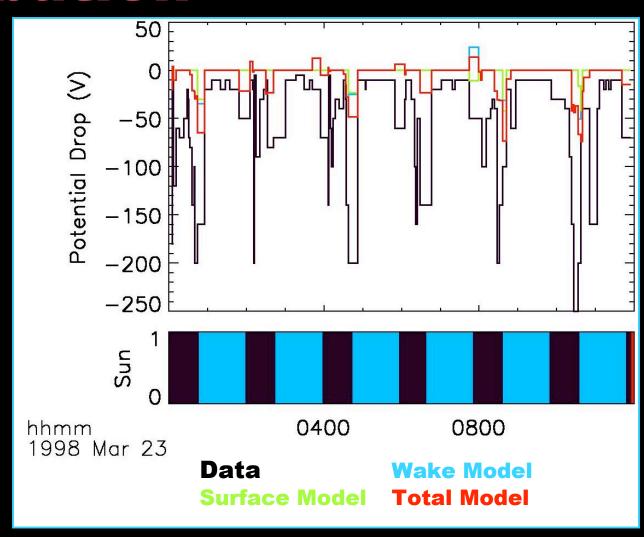
- Modified selfsimilar expansion model [Halekas et al., 2005] predicts:
 - Density
 - Temperature
 - Potential drop between spacecraft and surface due to wake potentials



Surface Charging Contribution

Too much secondary emission ($\delta = 1.5$)

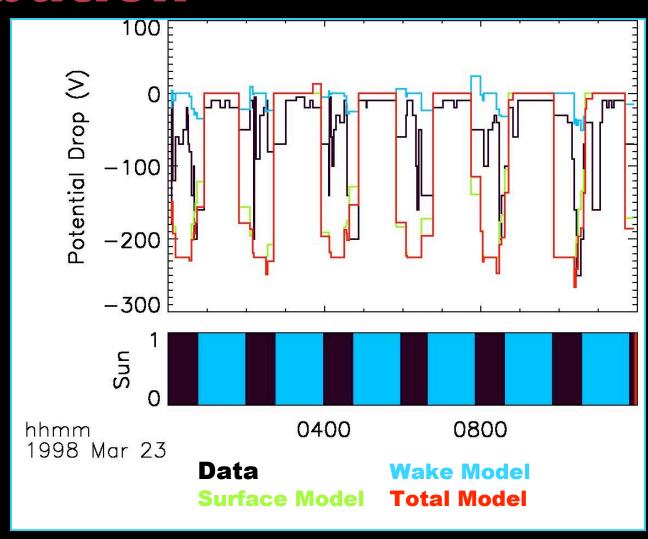
No negative surface charging



Surface Charging Contribution

Too little secondary emission ($\delta = 1.0$)

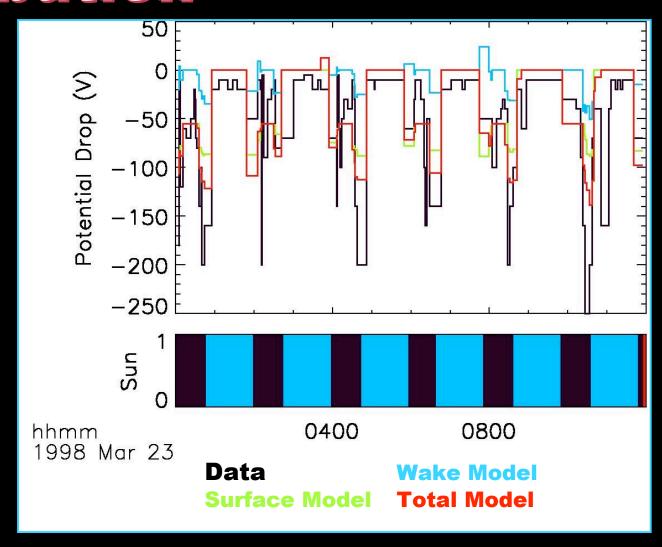
Too large negative surface charging

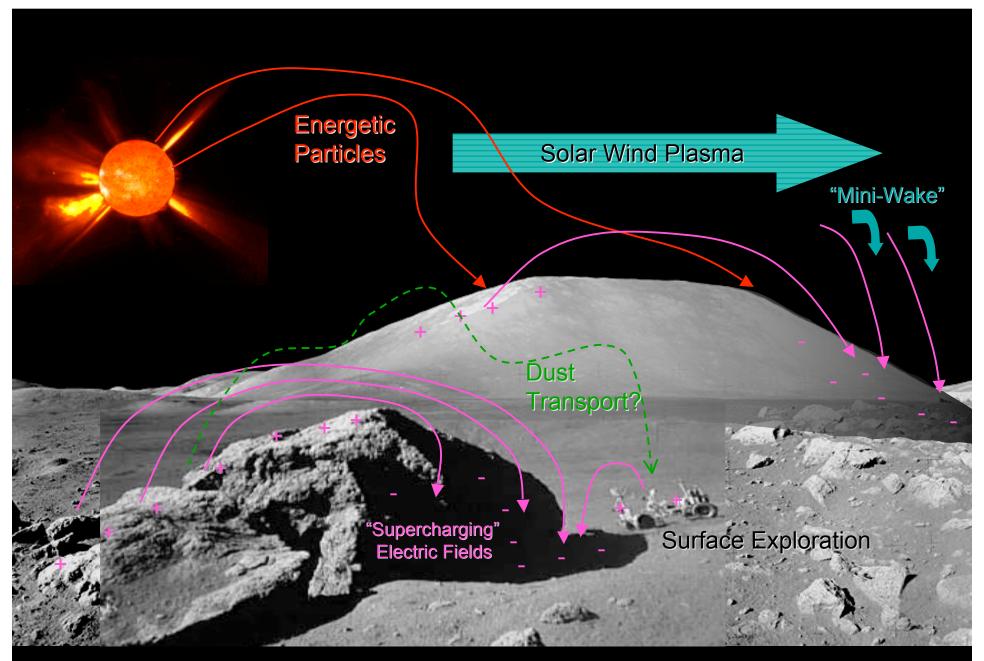


Surface Charging Contribution

Just right secondary emission ($\delta = 1.2$)

Getting closer....





From Macro to Micro-Scale

Conclusions

- On a global scale, both wake and surface electric fields important near the terminator and polar regions
 - More work to do...

- A challenge for the future:
 - Moving from macro to micro-scale